Working Casts and Dies



-definitions

-Requirements of casts and dies

-selection criteria of die materials

-die materials

-casts and dies systems

- Working (or master) cast is the positive reproduction of the prepared teeth, ridge areas, and other parts of the dental arch.

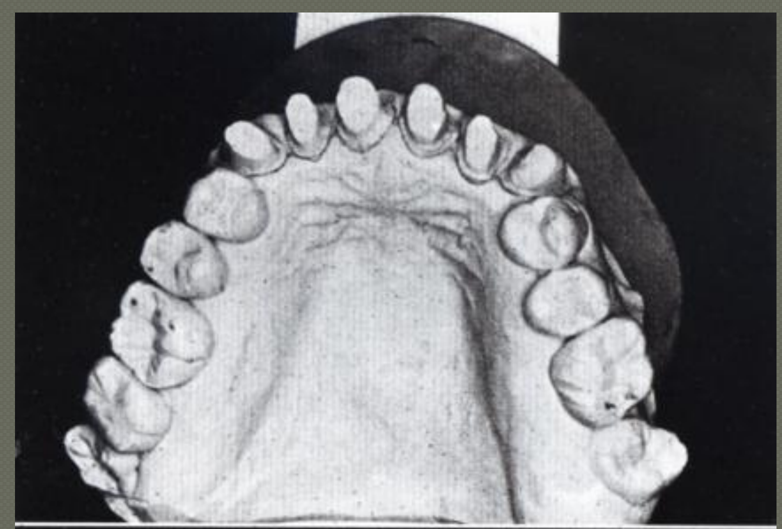
- Die is the positive reproduction of the prepared tooth and consists of a suitable hard substance of sufficient accuracy

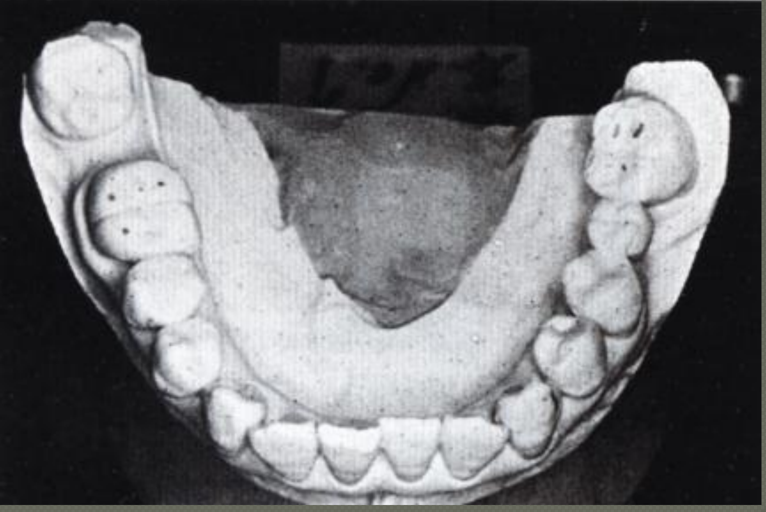




Requirements of the cast

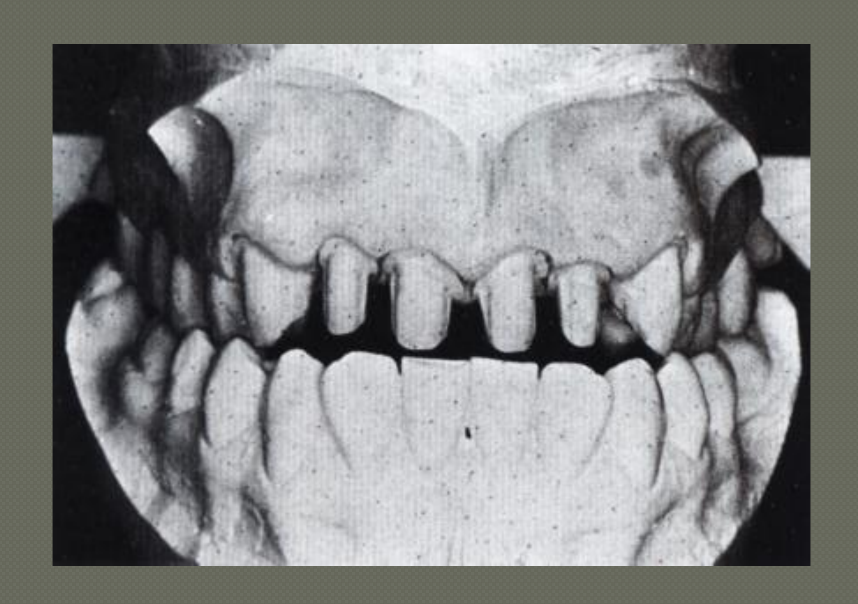
- It must reproduce both prepared and unprepared tooth surfaces and should be free of any voids or defects





Requirements of the cast

- All surfaces of any teeth involved in the anterior guidance and the occlusal surfaces of all unprepared teeth must allow for precise articulation of the opposing casts



Requirements of the cast

- All soft tissues should be reproduced in the working cast, including all edentulous spaces and residual ridge contours that will be involved in the fixed prosthesis

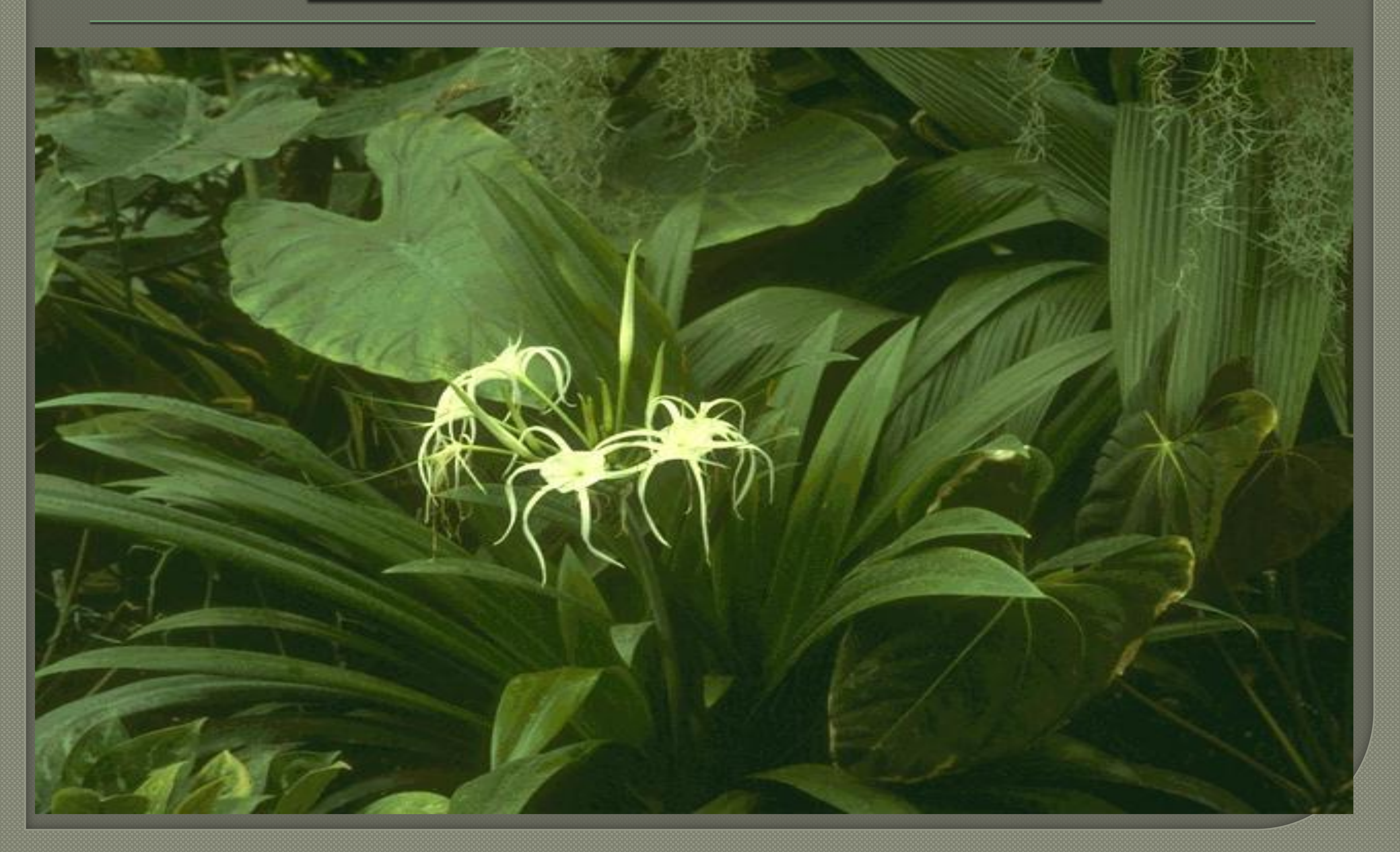
Requirements of the die

- It must reproduce the prepared teeth exactly; all surfaces must be accurately duplicated and no air bubbles or voids can be accepted.

- Finish line complete.

- The remaining unprepared tooth structure immediately cervical to the finish line should be easily discernible on the die, ideally with 0.5 to 1 mm visible to identify the contour of the tooth & allow margin adaptation.

Materials Science



SELECTION CRITERIA (Requirement of die material)

- High mechanical strength properties
- High surface hardness.
- High stability and excellent dimensional accuracy.
- Accurate detail reproduction.
- Easily sectioned and trimmed.

SELECTION CRITERIA Requirement of die material

- Available in contrasting colors.
- Compatible with separating agents.
- Wettable by wax.
- Compatible with impression materials.

Die Materials

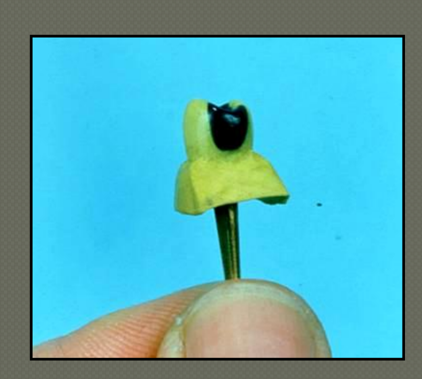
- 1. Improved stone(Gypsum)
- 2. Epoxy resins
- 3. Ceramic (refractory die)
- 4. Electroplated
- 5. flexible die material

GYPSUM PRODUCTS:

- **Type I: Impression Plaster**
- **Type II: Model plaster**
- **Type III: Dental stone**
- **Type VI: High strength dental Stone**
- **Type V: Improved Stone, Die Stone**



Edentulous Cast **Orthodontic Model** **Working Cast**



Removable Die with Waxed Inlay

I) GYPSUM

Advantages

- Inexpensive
- Compatible with most impression materials
- Reproduce fine details in the impression.
- Easy to use

GYPSUM

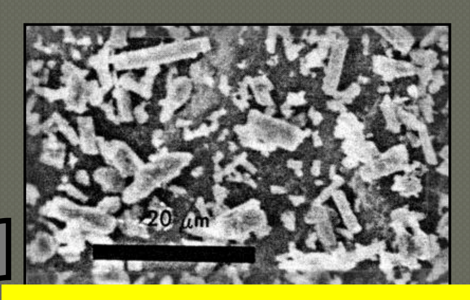
Disadvantage

1) Poor resistance to abrasion

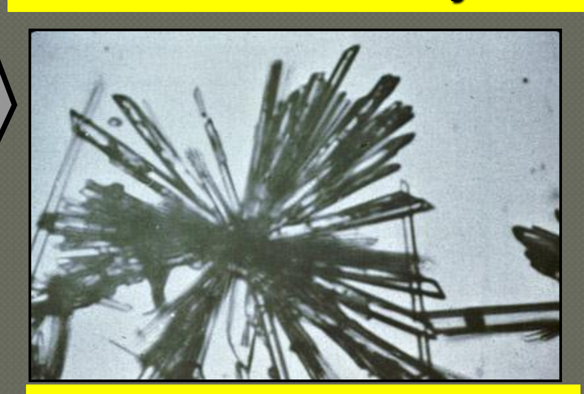
Overcome by:

- Gypsum hardeners (colloidal silica)
- Application of low viscosity resin (Cyanoacrylates).
- Resin- strengthed gypsum product e.g Resin Rock
- Gum arabic and calcium hydroxide mixture.

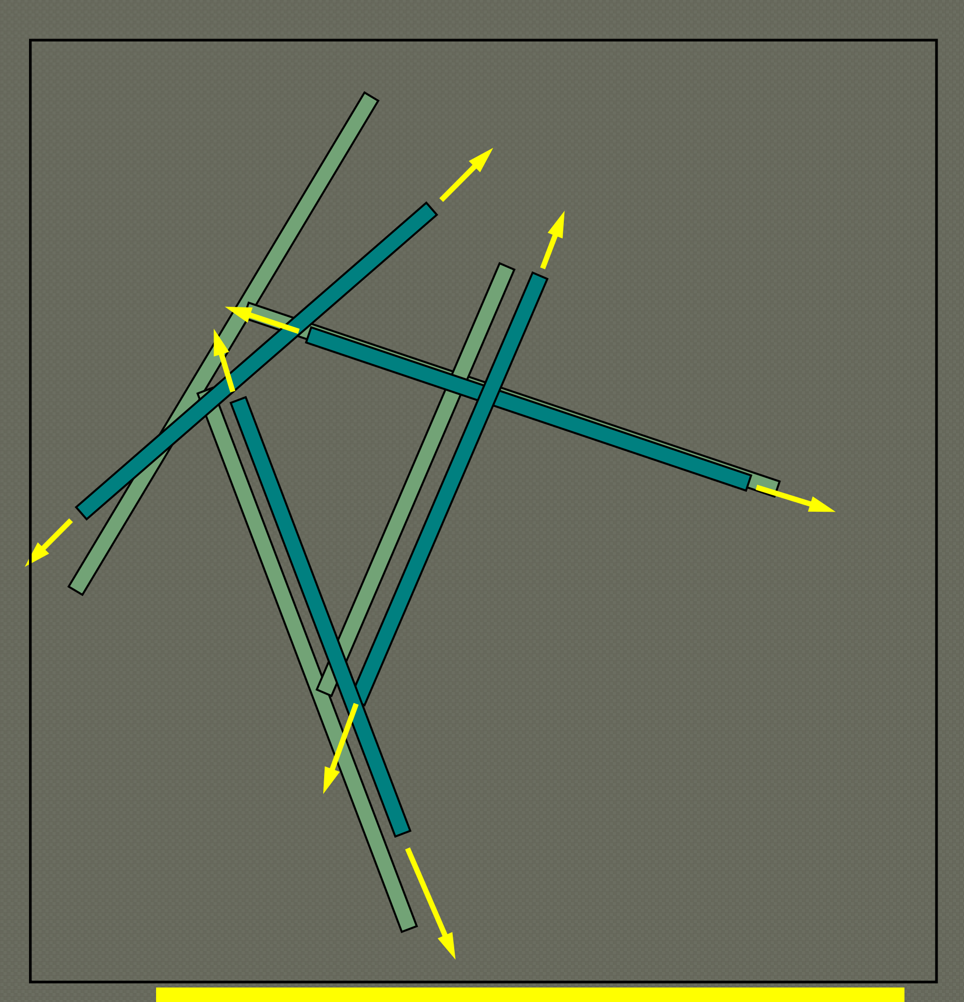
2) Setting expansion



Dissolution of hemihydrate



Precipitation of dihydrate



Crystal expansion and interlocking

2)Setting expansion:

Linear expansion occur during setting (0.06-0.9%).

To Control setting expansion: Avoid:

1. Decrease water/ powder.
2. Increasing mixing time.
3. Immersion of gypsum products in water during the setting process.
4. Increasing temperature of mixing water from 23-30°.

Follow the manufacturer's instruction for the current water/powder ratio and manipulation.

II) RESIN

- Resin are used as a die material to overcome the low strength and abrasion resistance of die stone e.g:
- Epoxy resin
- Polyurethane

RESIN

Advantages

- High strength
- High abrasion resistance

Disadvantages

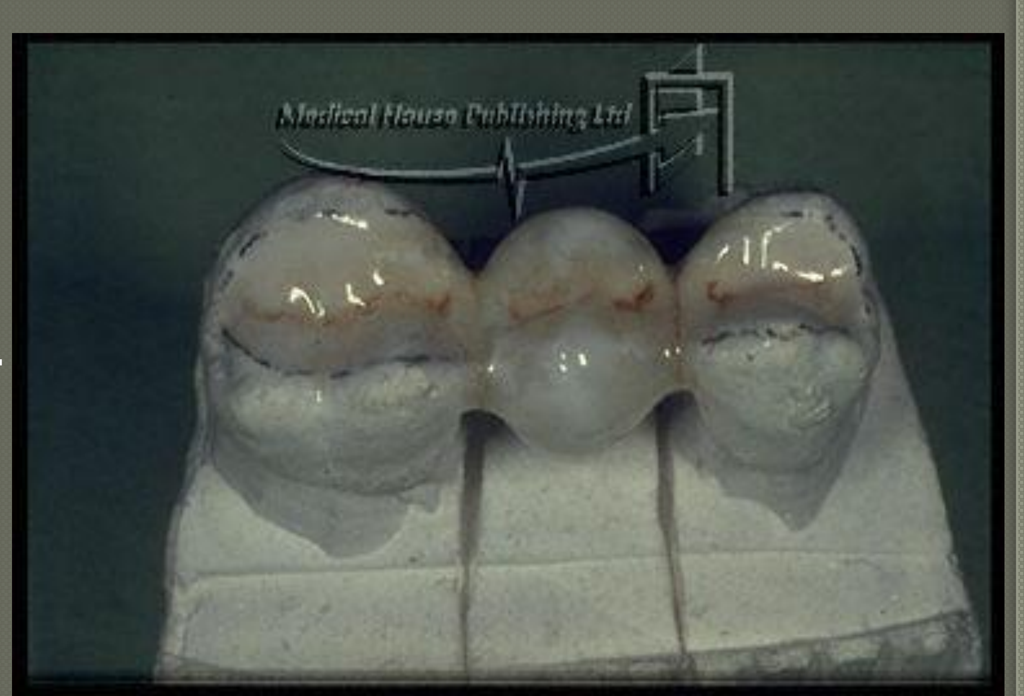
•Expensive

•Polymerization shrinkage of resin material so undersized die.

•Long setting time.

III) Ceramic (Refractory die)

- Ceramic material mainly quartz silica
- Can withstand very high temperatures without any distortion
- Special for construction of all-ceramics because it allows porcelain to be built direct on the die.



IV) Electroplated die

Electrolytic deposition of a coat of pure metal on the impression

- High accuracy.
- High strength.
- High abrasion resistance.
- Dimensional stability.





Working cast and die systems

- **I. Working cast and a separate die**
- **II. Working cast with removable dies**
- **III. Single Die:**

  - Stone die
  - Amalgam die
  -Acrylic die
  - Ceramic die(refractory die)
  - Electroplated die

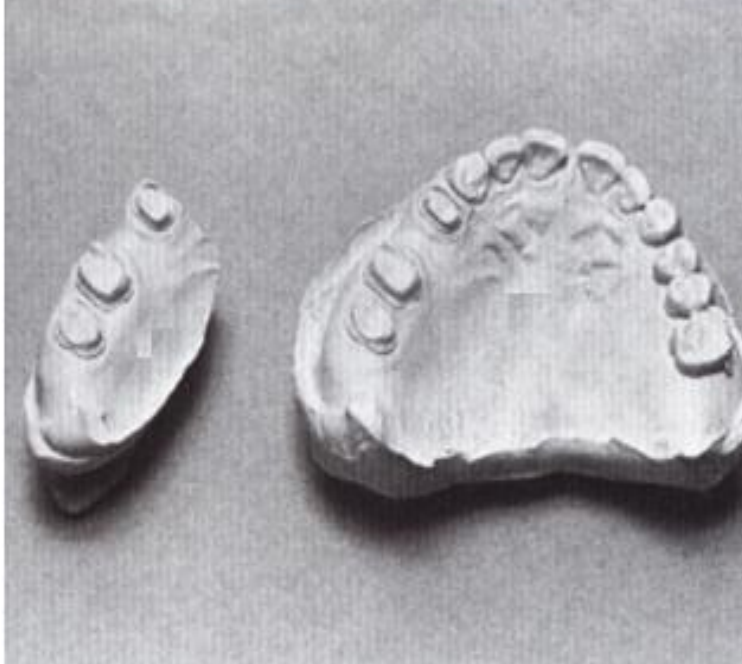
I.Working cast and a separate die

•Full arch cast for proximal contact and occlusion

•Sectional cast (Separate die) for wax coping and margins







Advantages:

- Ease of fabrication
- Keep the relationship between abutments fixed and immovable .

Disadvantages:

- Fragile wax patterns are difficult to transfer between the two parts(from cast to die). So distortion of some of internal adaptation

- The second pour of the impression may be different (slightly larger) than the first, therefore, it may be necessary to relieve the stone slightly to seat the pattern

Impression pouring

Proportion P and L





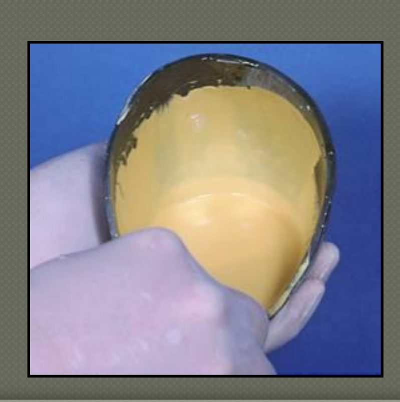
Bulk P

Pre-packaged P

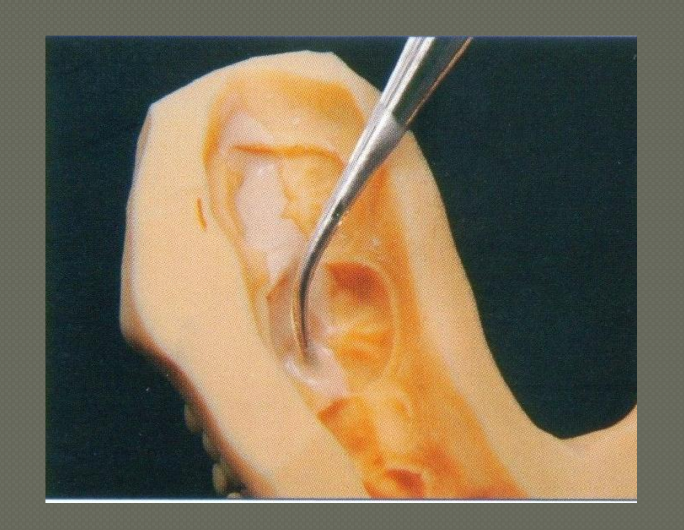






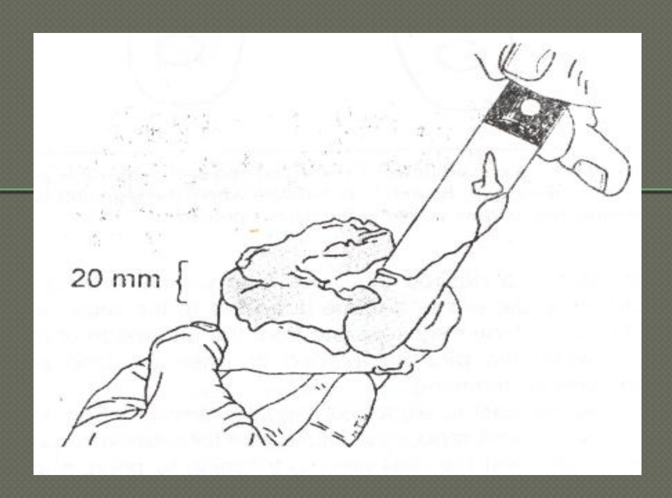


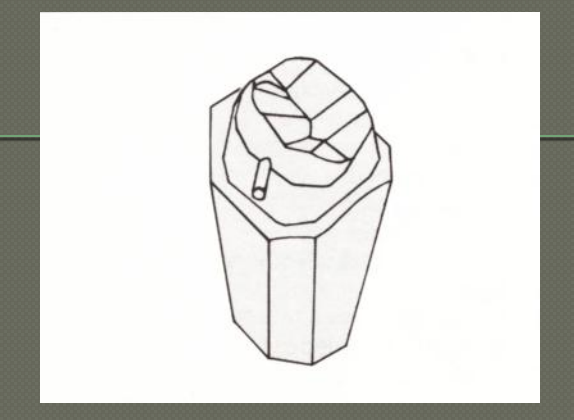


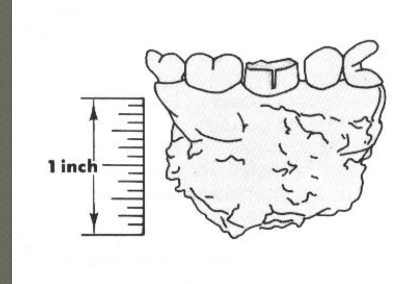


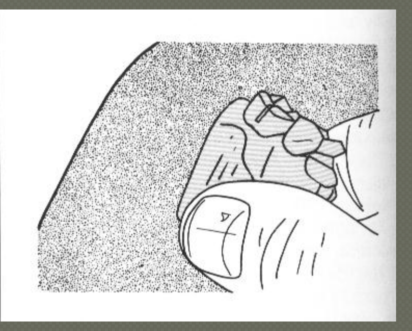





20 mm

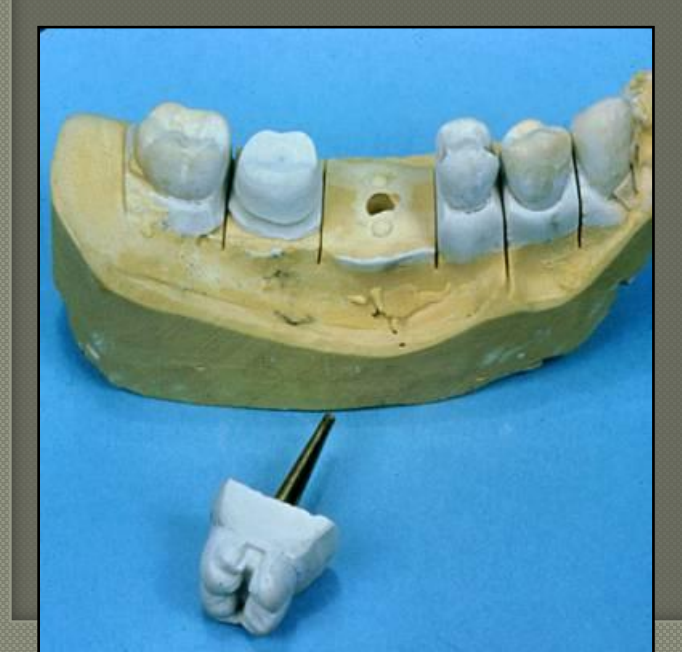



1 inch



II. Working cast with removable dies

- Retained by pins in a base (stone or plastic)
- One die used for proximal contacts, occlusion and margins



Working Cast with Removable Dies



Requirements of removable Dies

- 1. The dies must return to their exact positions.
- 2.Dies are stable even when inverted and accurately related to adjacent and opposing teeth
- 3. Dies are removable individually

Removable Die Techniques:

A. Dowel Pin Technique

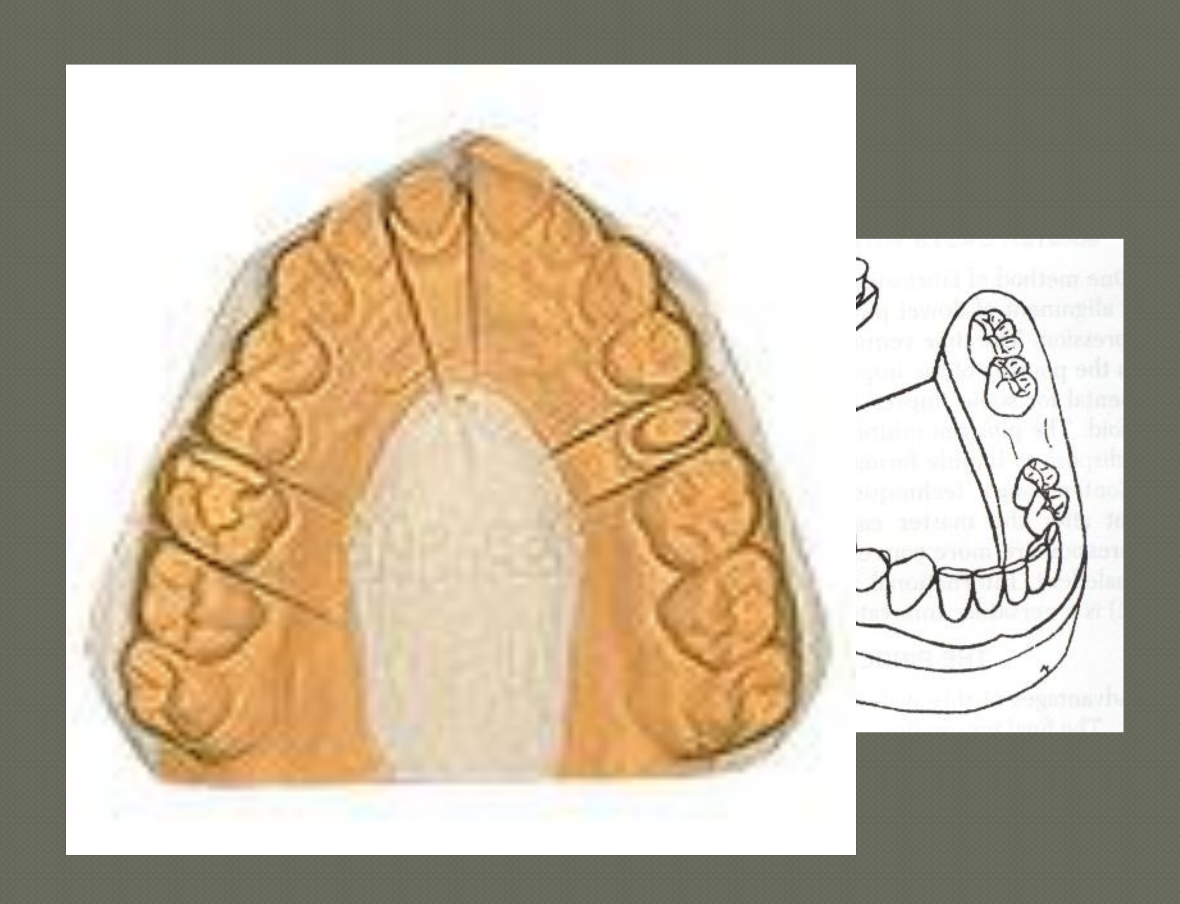
B, Pindex system

C. Di-lock tray technique

D. DVA Model system

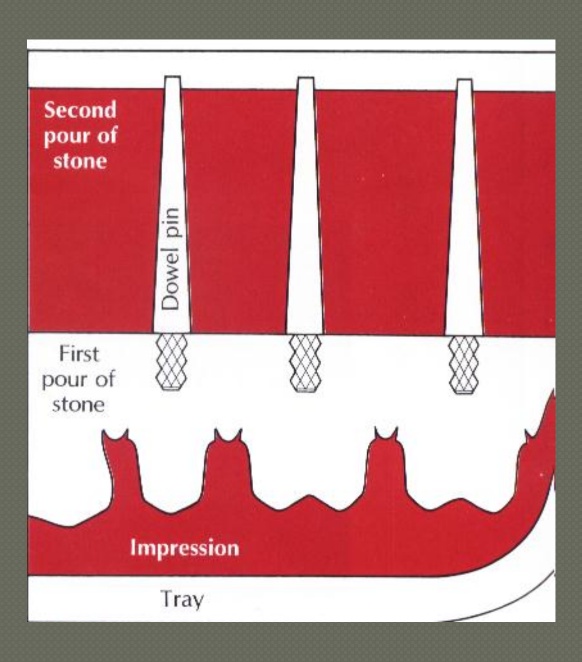
E. Zeiser Model system.

A. Dowel Pin Technique



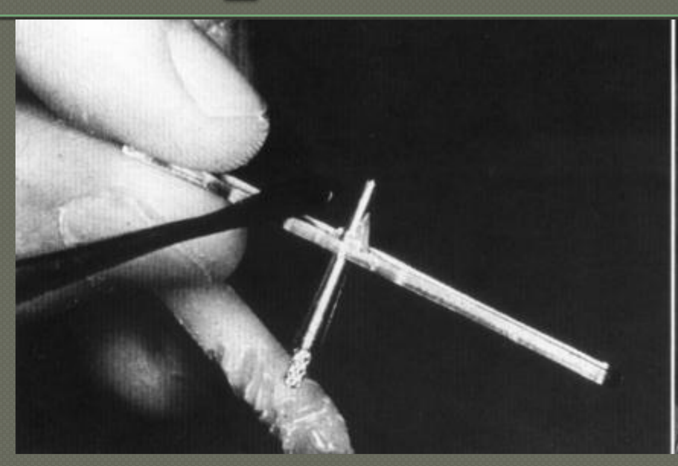


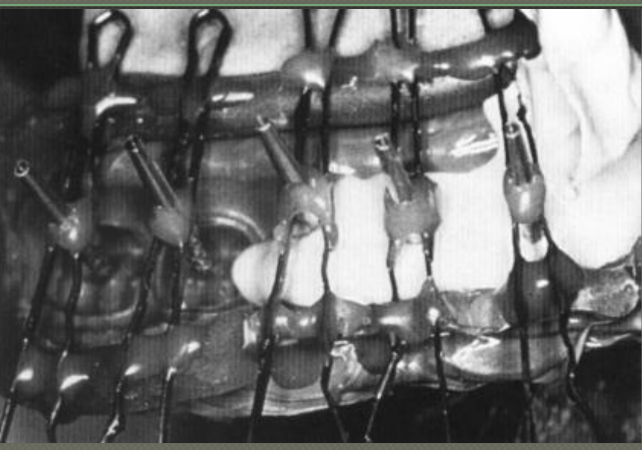
Technique

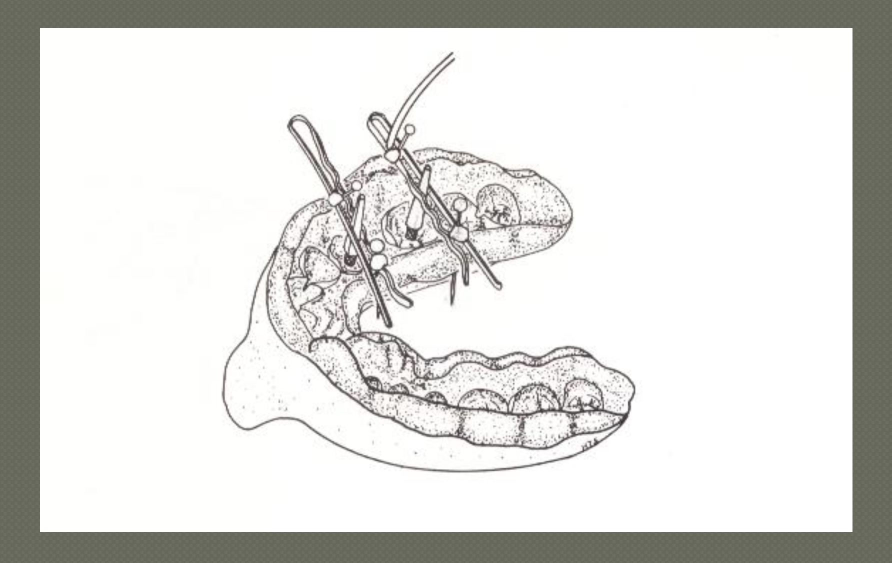


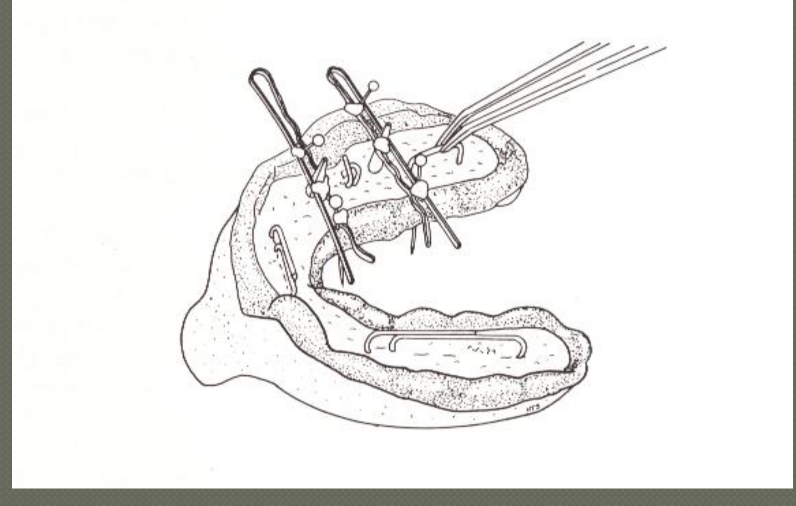
Second pour of stone
Dowel pin
First pour of stone
Impression
Tray

Technique

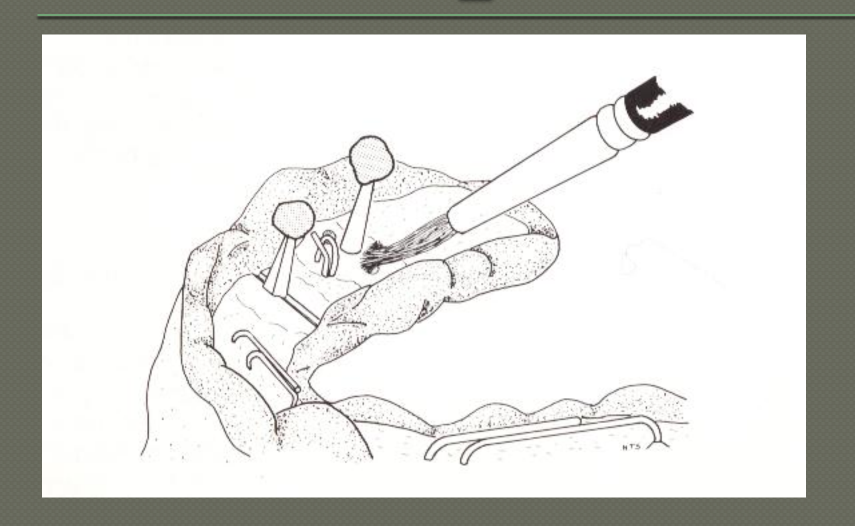


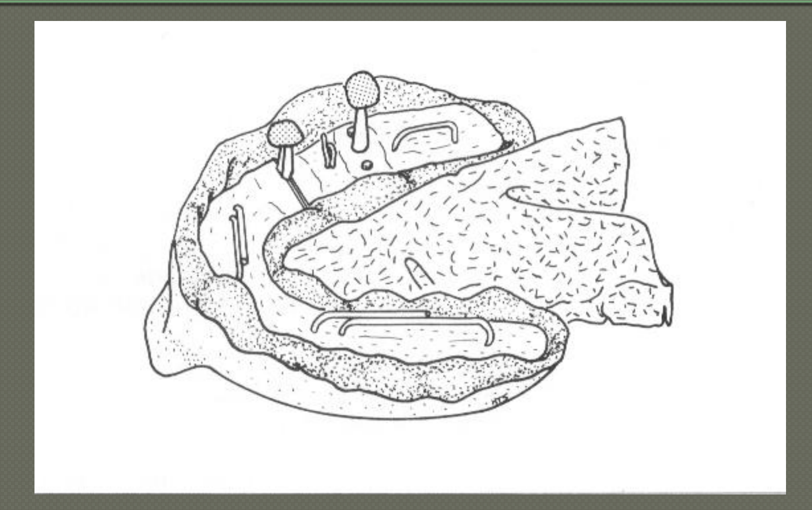


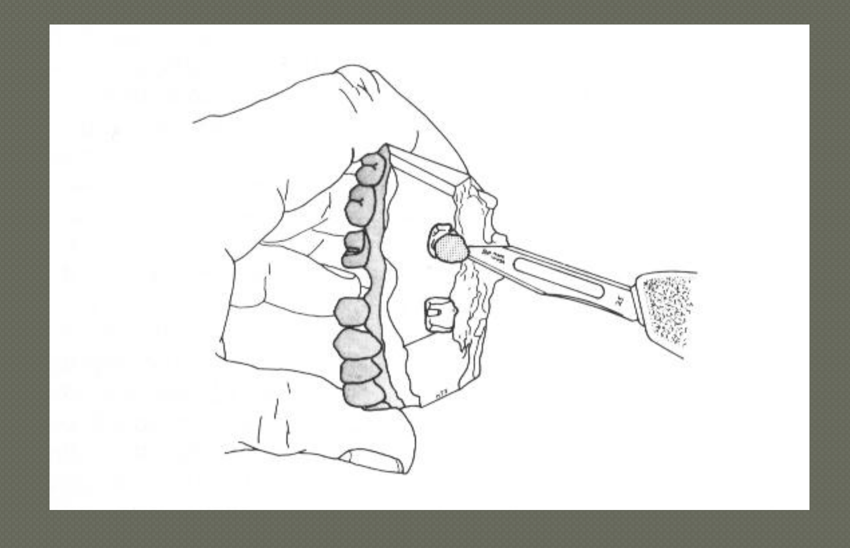




Technique



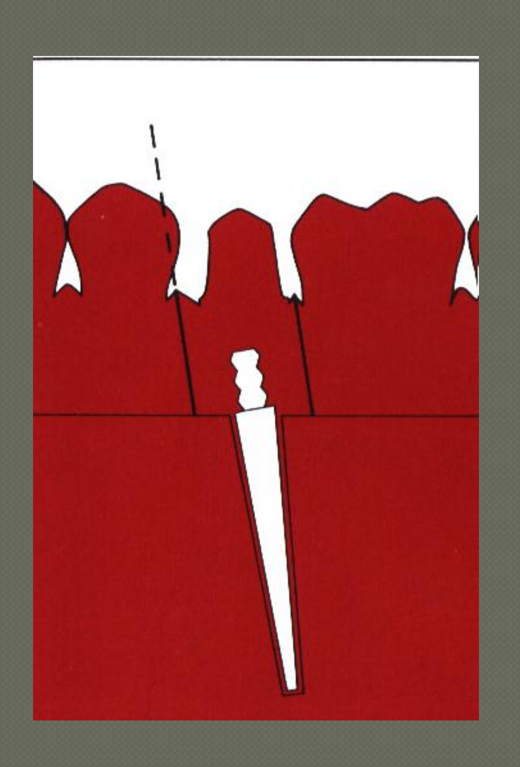


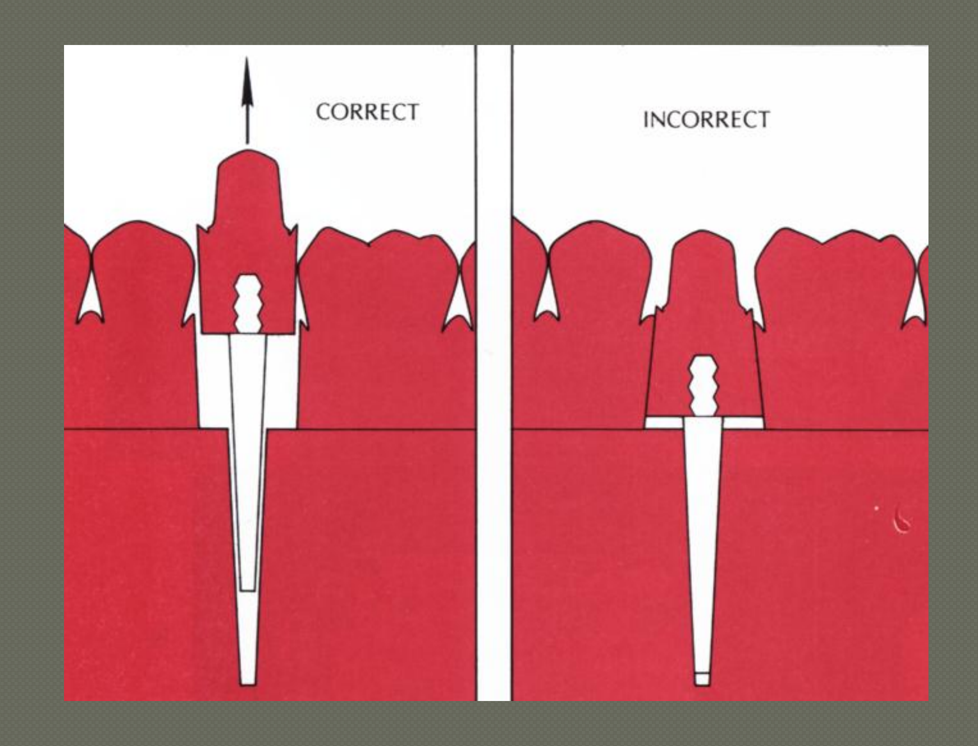


Sectioning and die preparation



Sectioning and die preparation









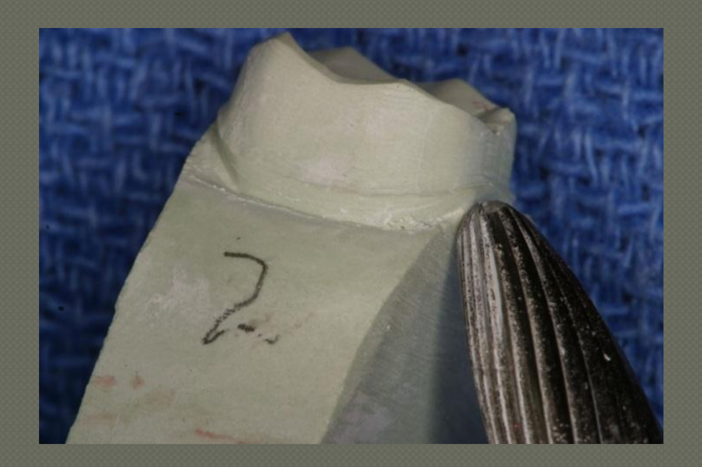
Die trimming:

- Remove most of excess stone with Arbor band.

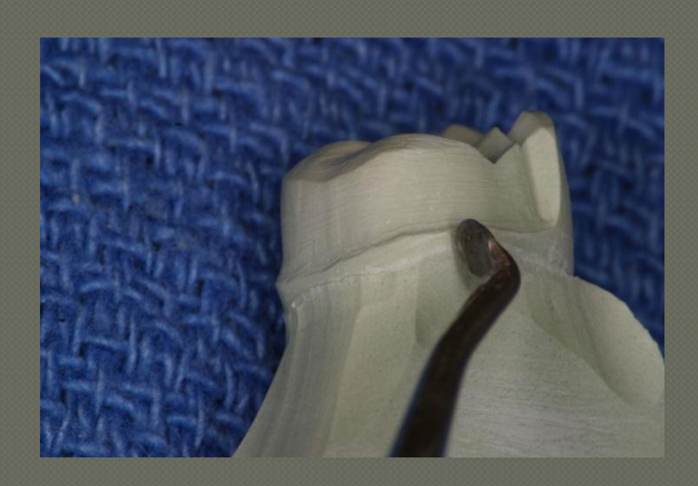
- Use a pear shaped acrylic bur to trim the die apical to the finish line of the preparation.

- Then fine trimming and smoothening with scalpel or cleoid-discoid carver.





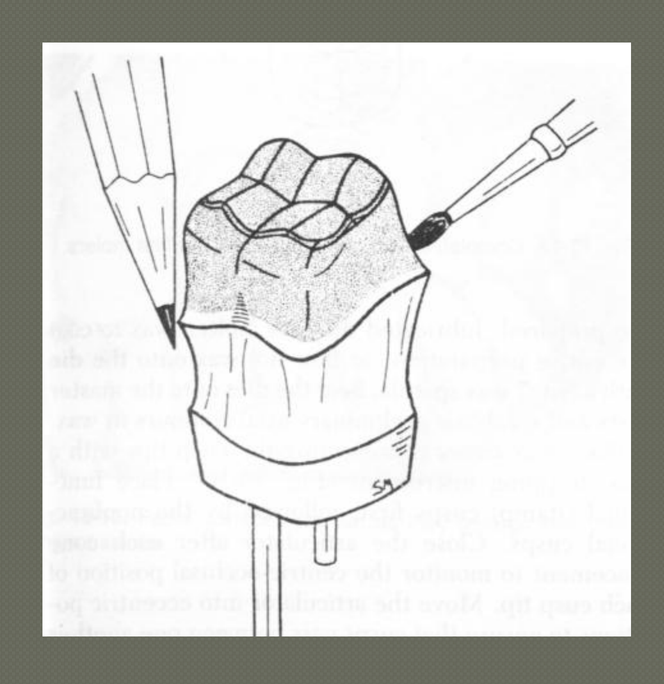




Advantages of die trimming:

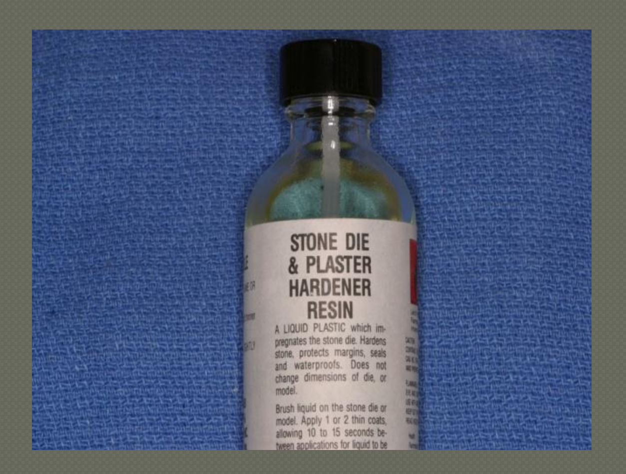
- Accentuate the finish line
- Resembling the normal contour of the natural root for proper cervical contouring of the wax pattern.
- Produce smooth area gingival to the finish line

The original contour of the tooth structure below the margin must be preserved. Over trimming (dotted line) will result in over contoured restoration



Die Preparation

- 1. Apply die hardener
  - Cover die beyond finish lines
  - Allow to set for 5 minutes
- 2. Apply die spacer
  - 40 micron thickness allows space for cement
  - 2-3 coats placed
  - Spacer 1 mm from finish line

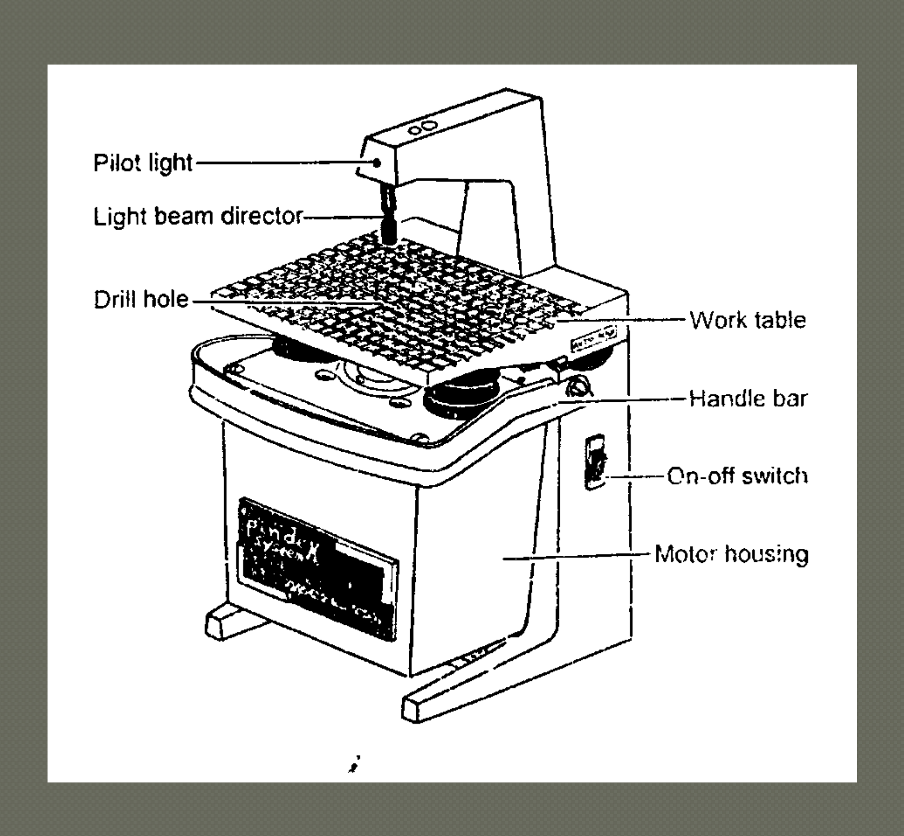

STONE DIE
& PLASTER
HARDENER
RESIN
A LIQUID PLASTIC which impregnates the stone die. Hardens stone, protects margins, seals and waterproofs. Does not change dimensions of die, or model.
Brush liquid on the stone die or model. Apply 1 or 2 thin coats, allowing 10 to 15 seconds between applications for liquid to be

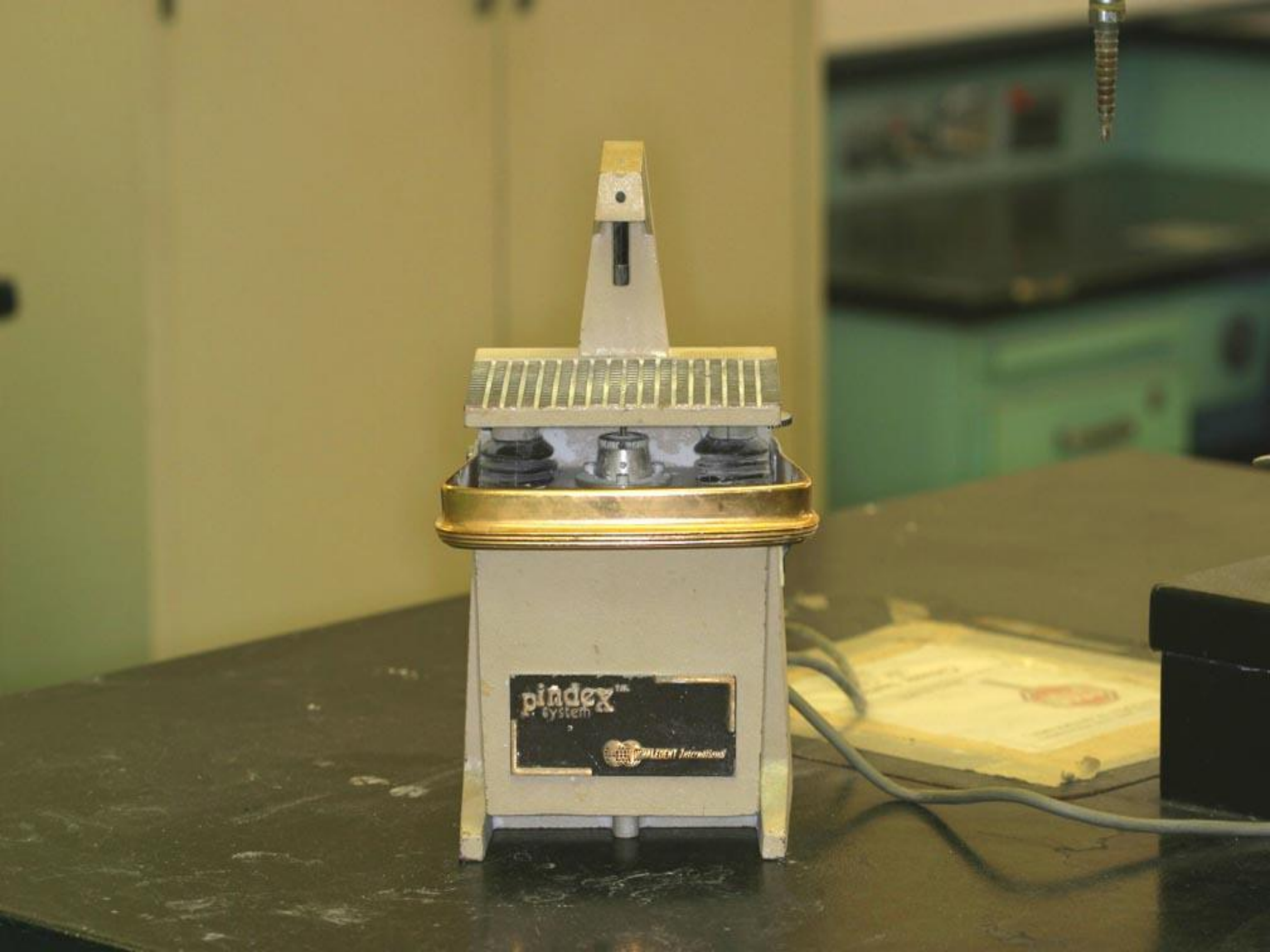


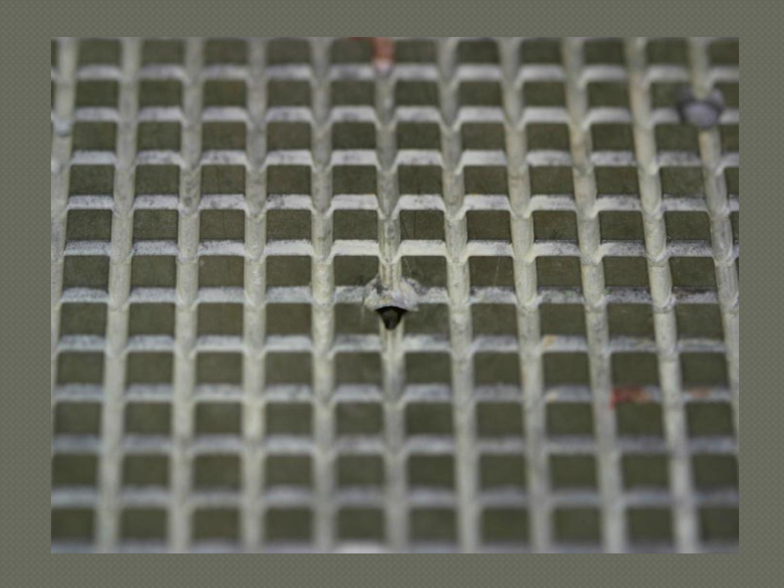


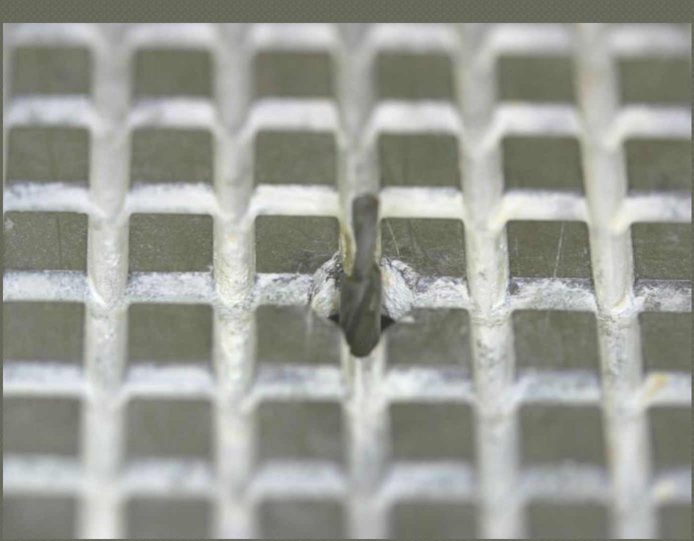


B) Pindex System




pindex TM
system



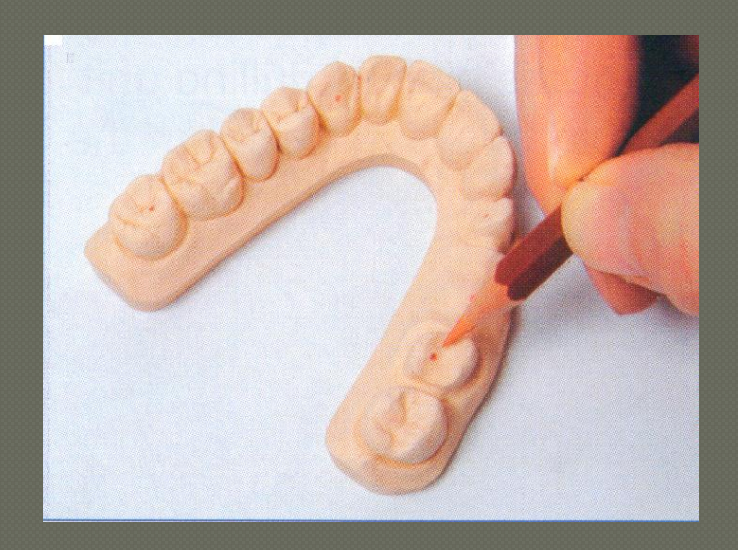


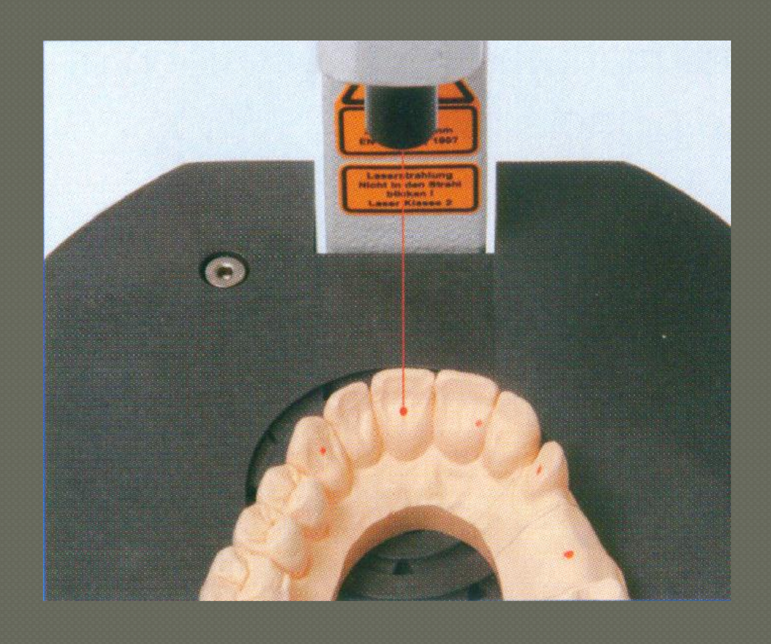
Create Pin Channels

- 1. Base of the cast is flat and smooth and parallel to the occlusal plane
- 2. Cast is 15-20 mm thick from gingival crest to the base
- 3. Each segment must have at least 2 pins for stability and to prevent rotation
- 4. Parallel pin channels at least 5 mm apart

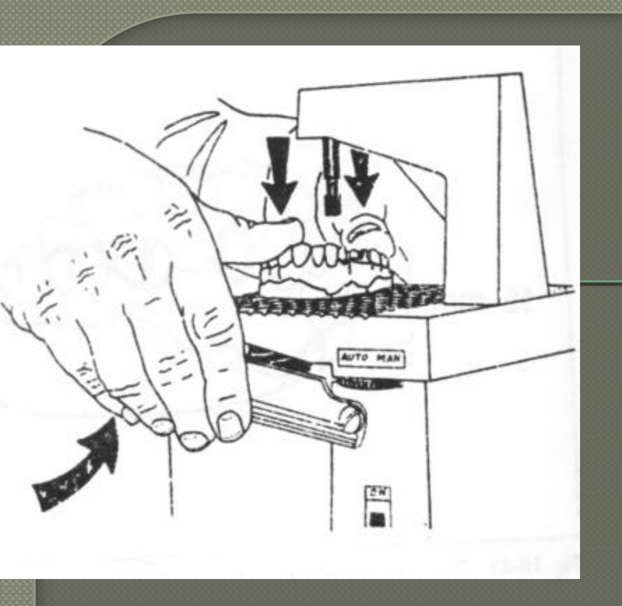
Base of cast to gingival crest 15-20 mm



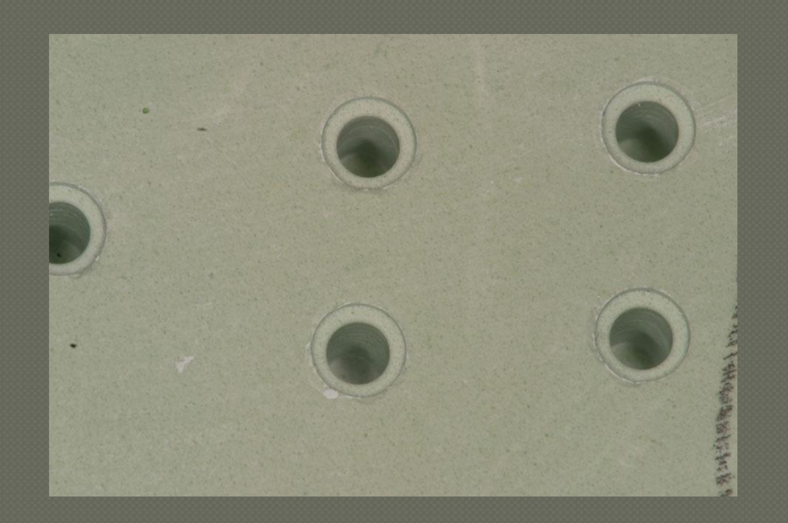






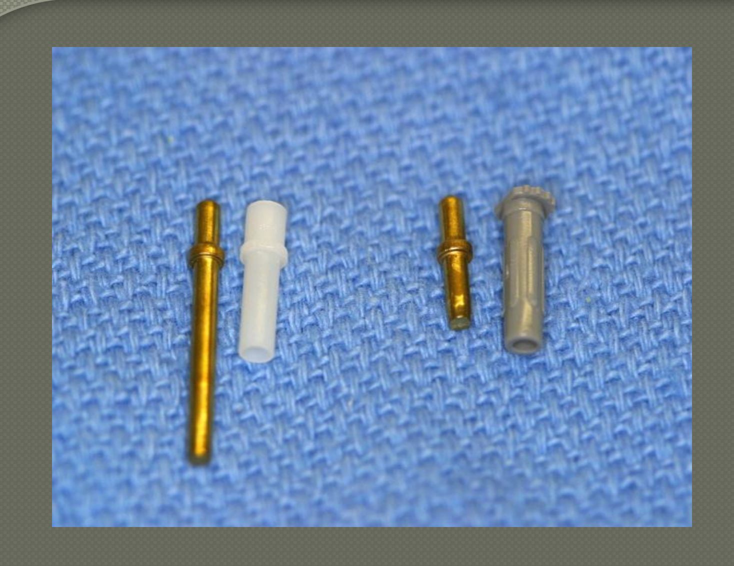

AUTO MAN



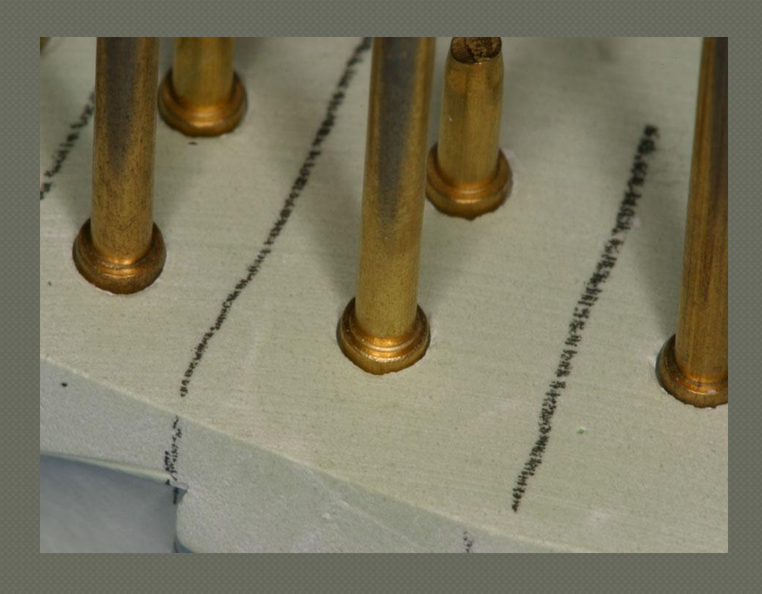


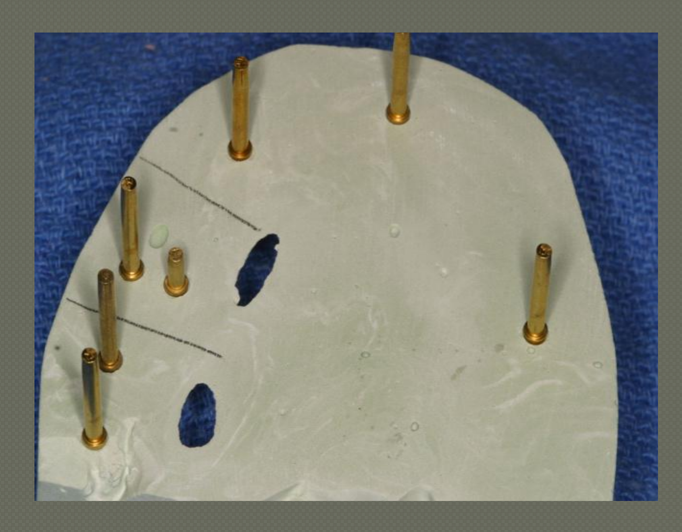
Index the Cast

- 1. Glue pins with cyanoacrylate cement
  - Long pin toward facial
  - Short pin toward lingual
  - Glue short pins first (better access)
- 2. Place sleeves on pins (stability of pins)
- 3. Box and seal cast
- 4. Apply separating solution (Super-Sep)
- 5. Pour second base with yellow stone




NET WT .07 OZ (2g)
INSTANT
Krazy® GLUE
ALL PURPOSE



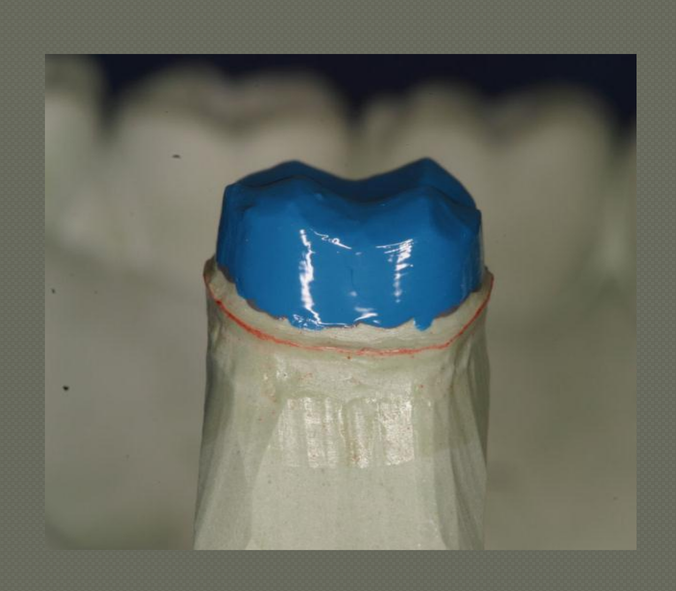


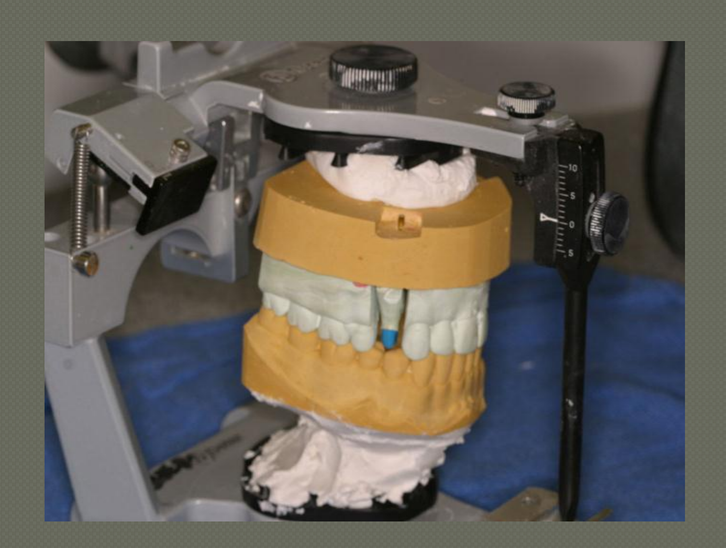






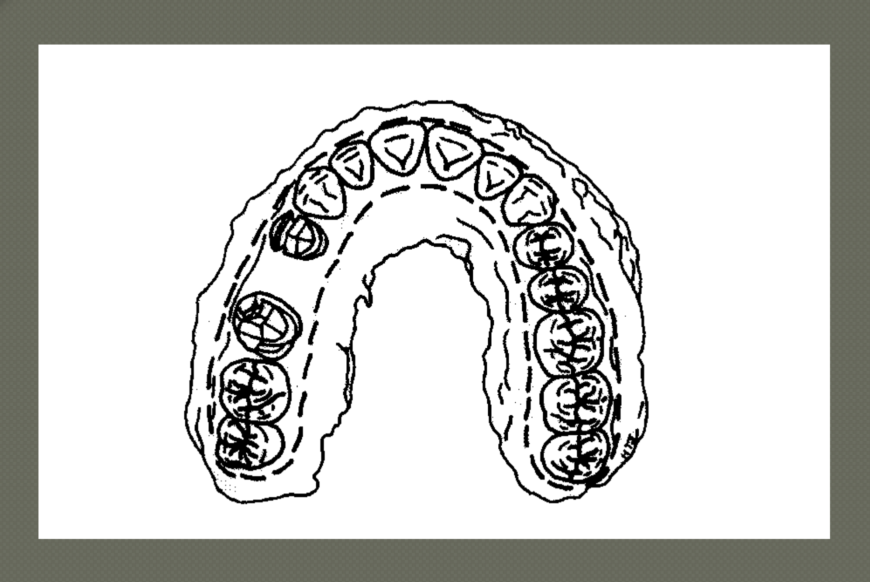


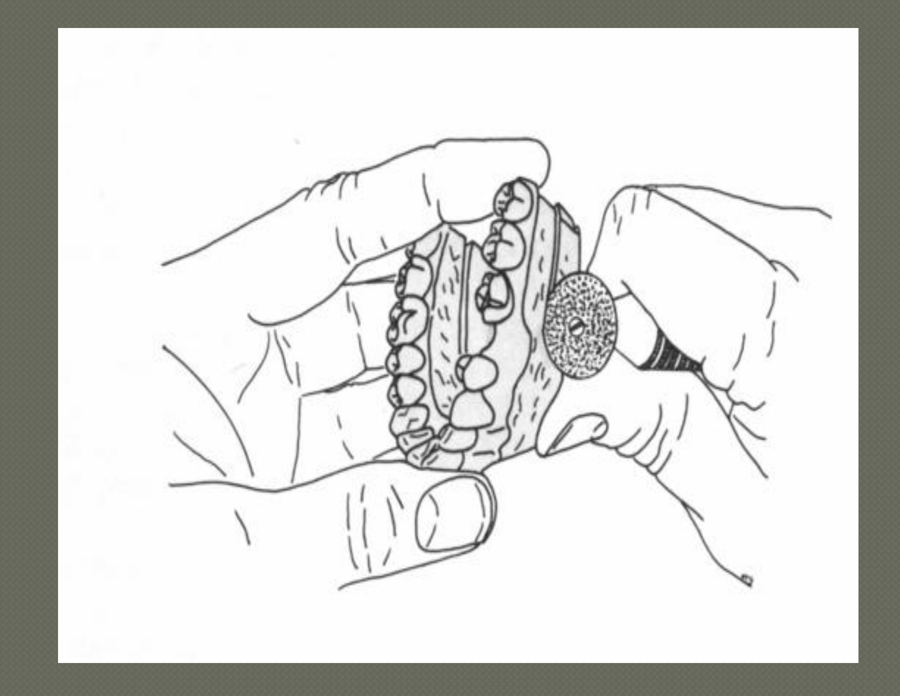


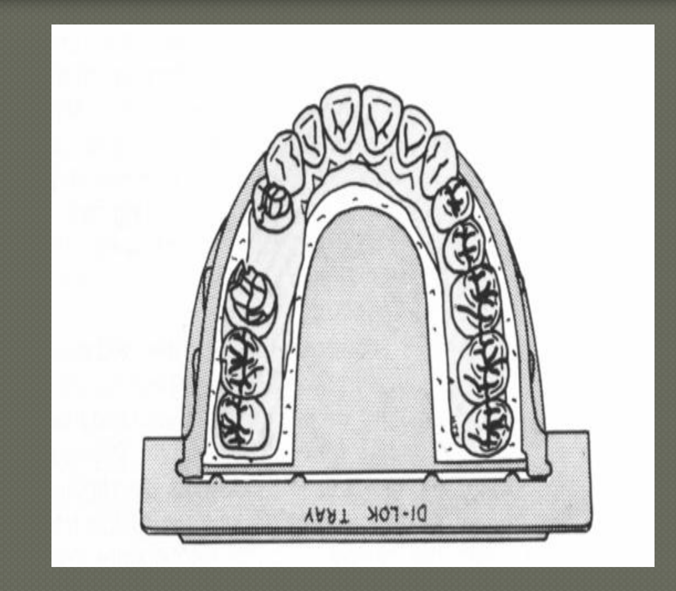


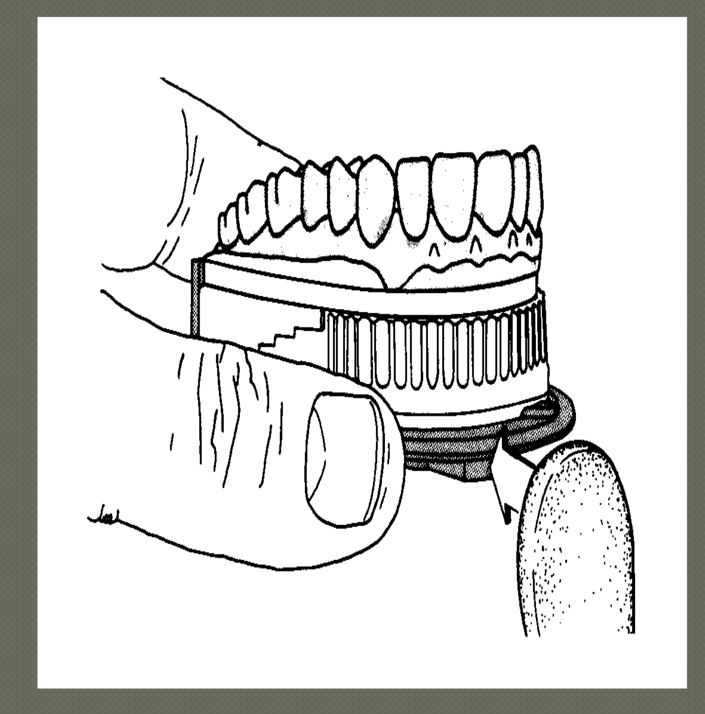
C. Di-lock tray technique

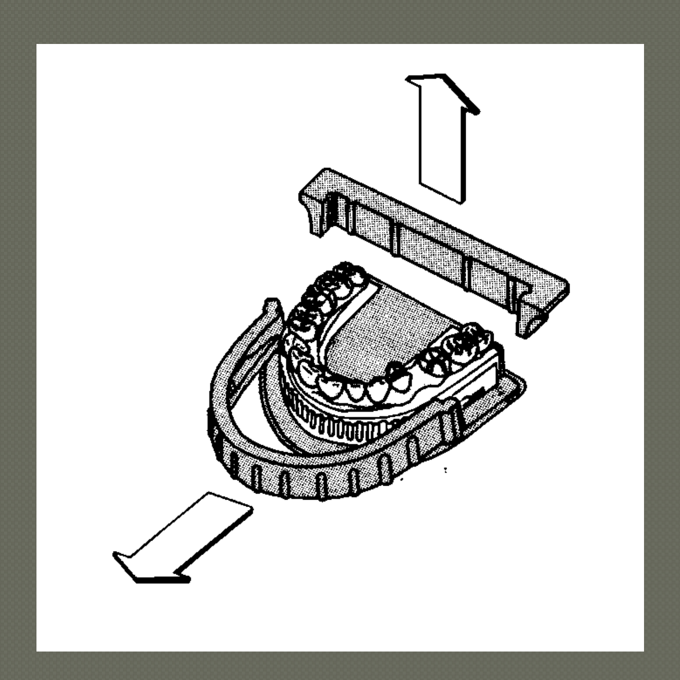


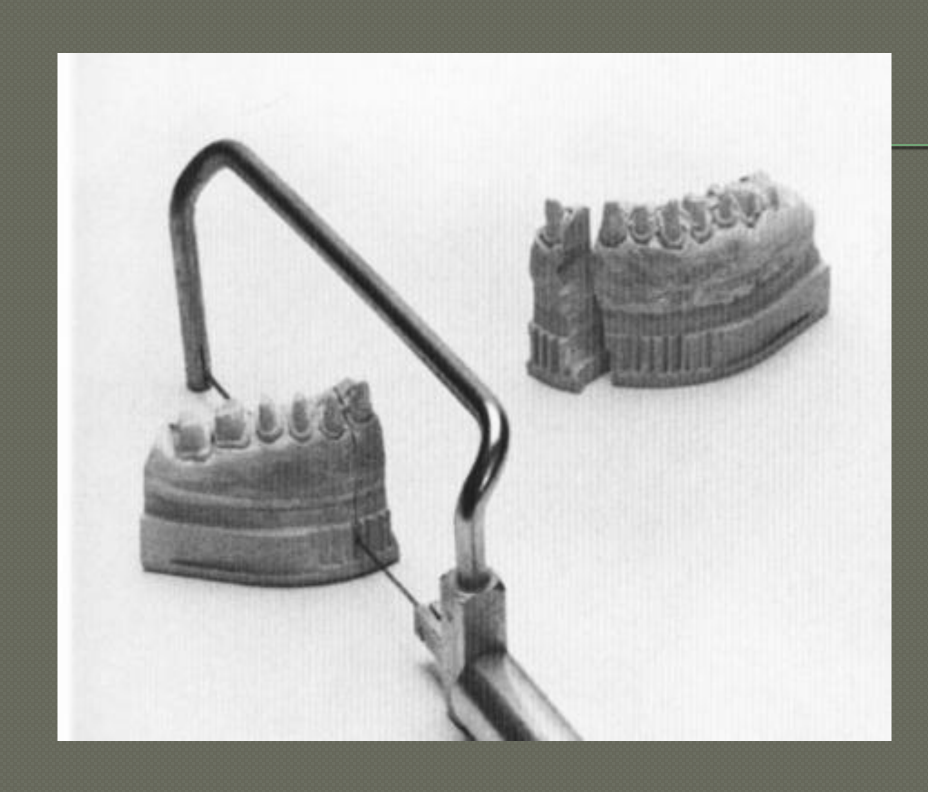


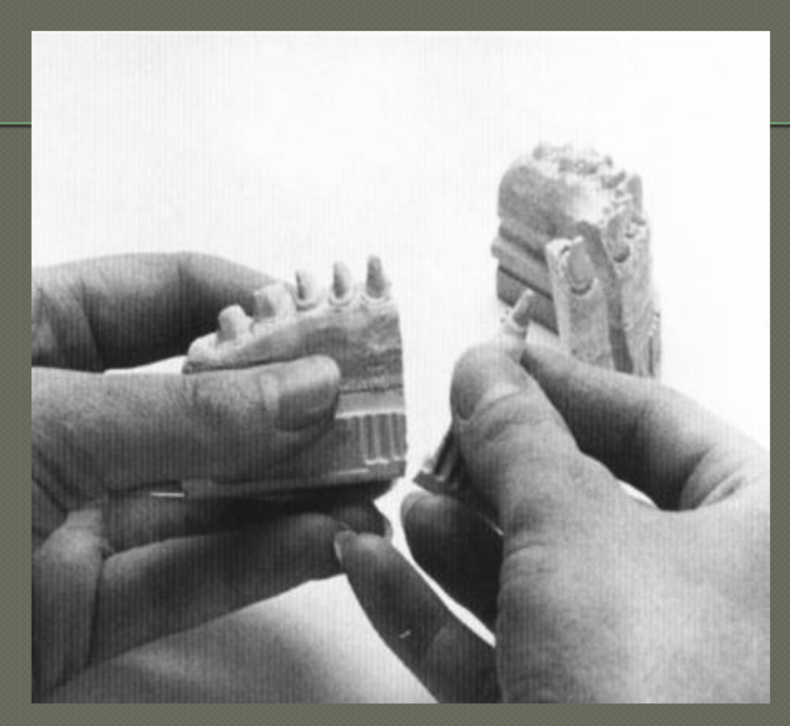


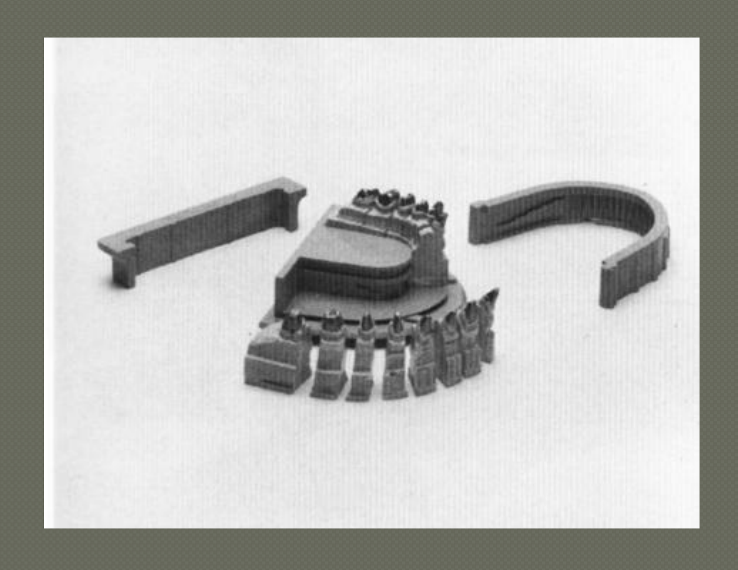

DI-LOK TRAY





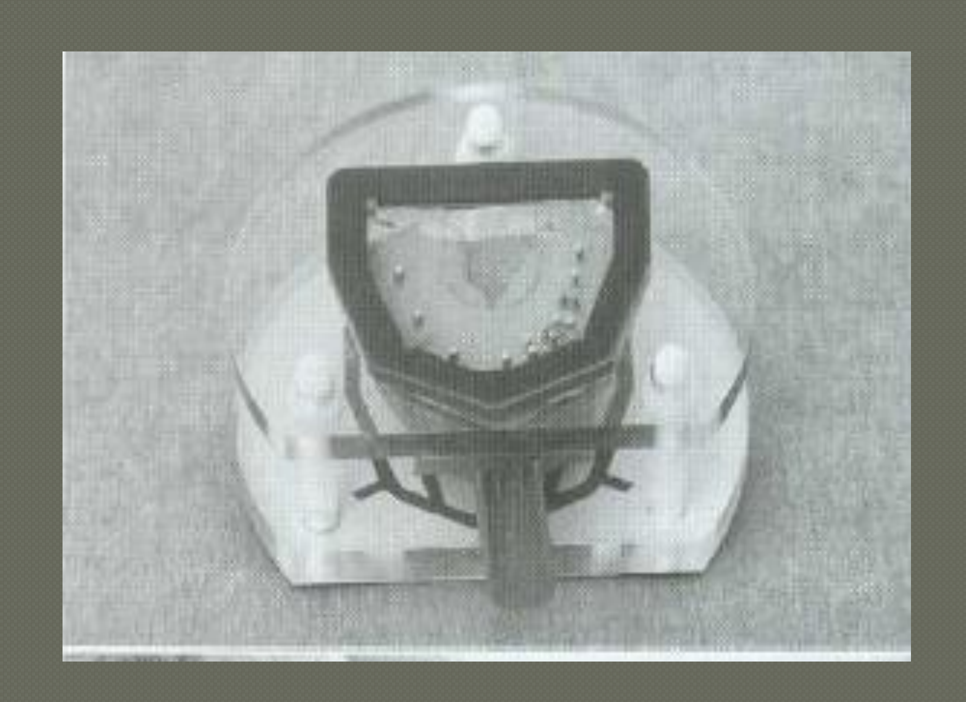


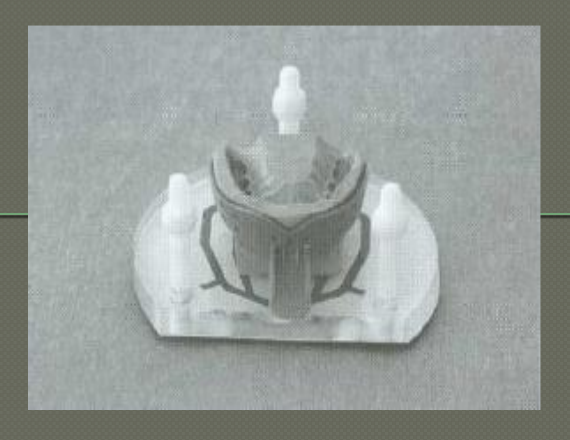




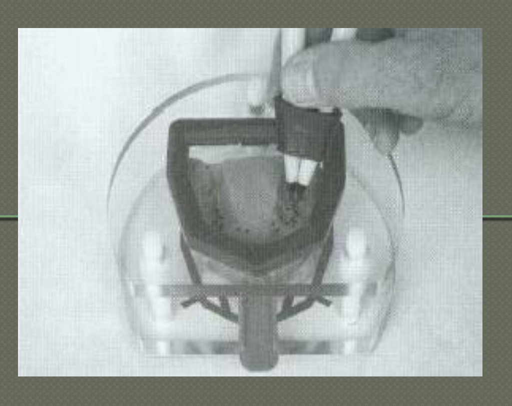


D) DVA Model System





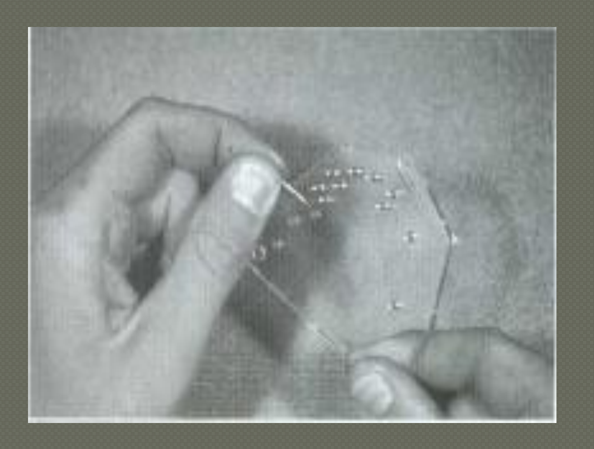
Trimmed impression on alignment fixture



Marking dowel pin locations on clear plate



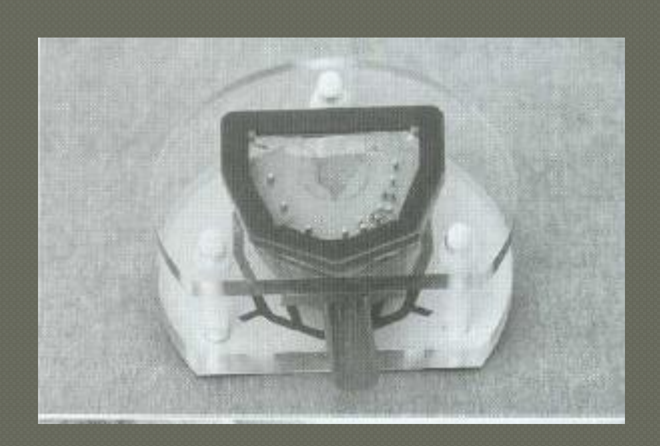
Drilling holes for dowel pins as marked



Inserting dowels in the base plate.
An adhesive is not required

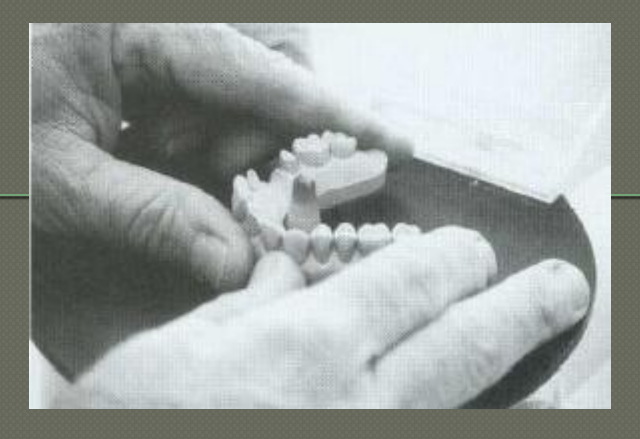


The impression is poured, stone is placed around dowel pins, and the alignment fixture is replaced over poured impression.





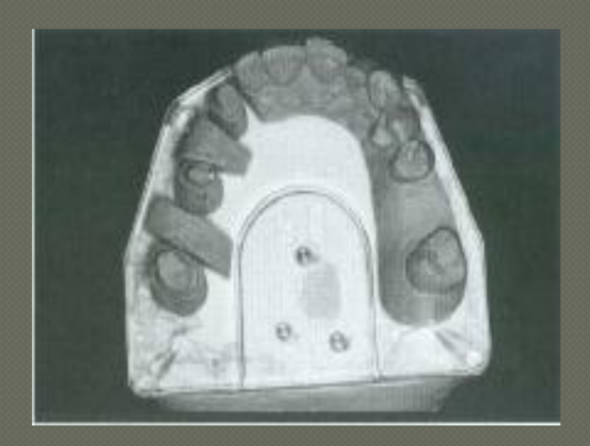
Set cast is removed from base plate and trimmed



Cast is trimmed.



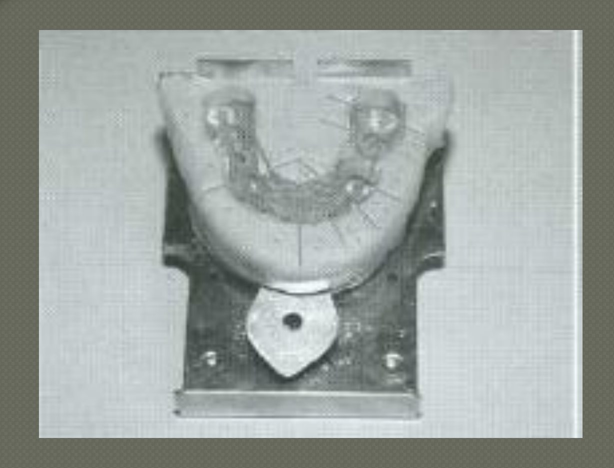
Cast is sectioned

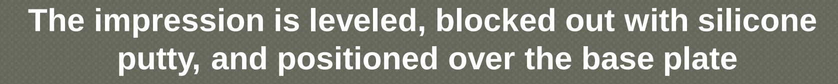


Trimmed working casts using the DVA Model System.

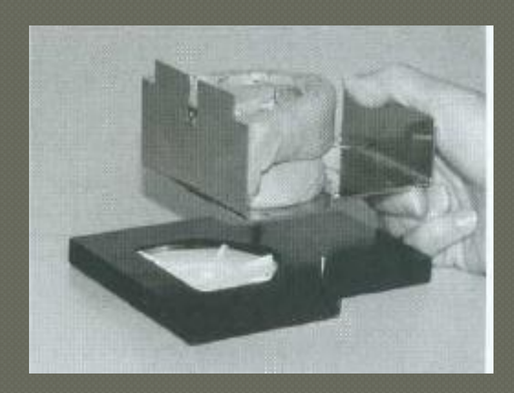
E) Zeiser Model System







The impression is leveled, blocked out with silicone putty, and positioned over the base plate





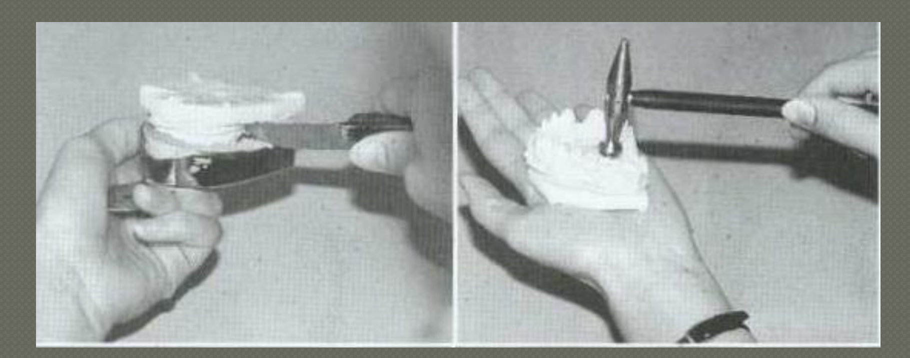
The pin locations are determined and the pinholes drilled in the base



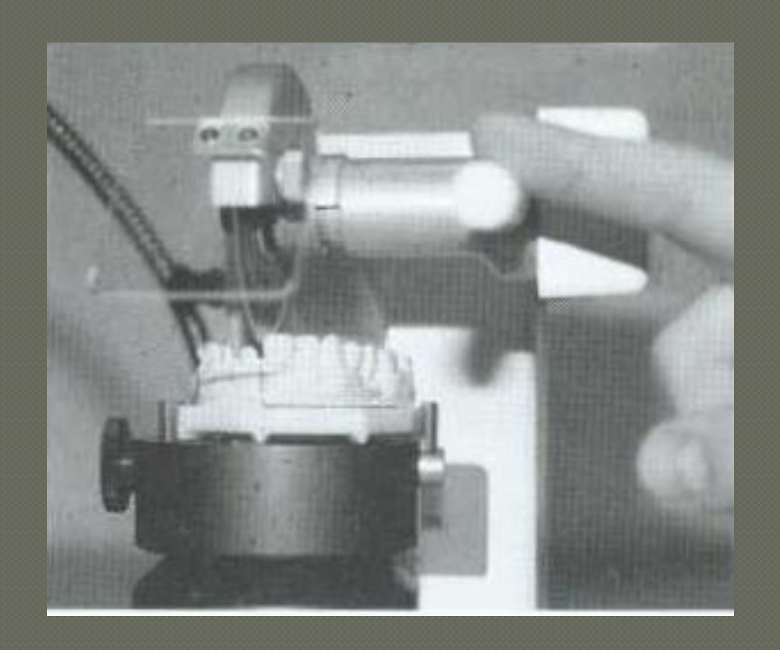
pins are inserted into the base.



The impression is poured and the base inverted into the stone



The cast is separated from the impression when set and then separated from the base



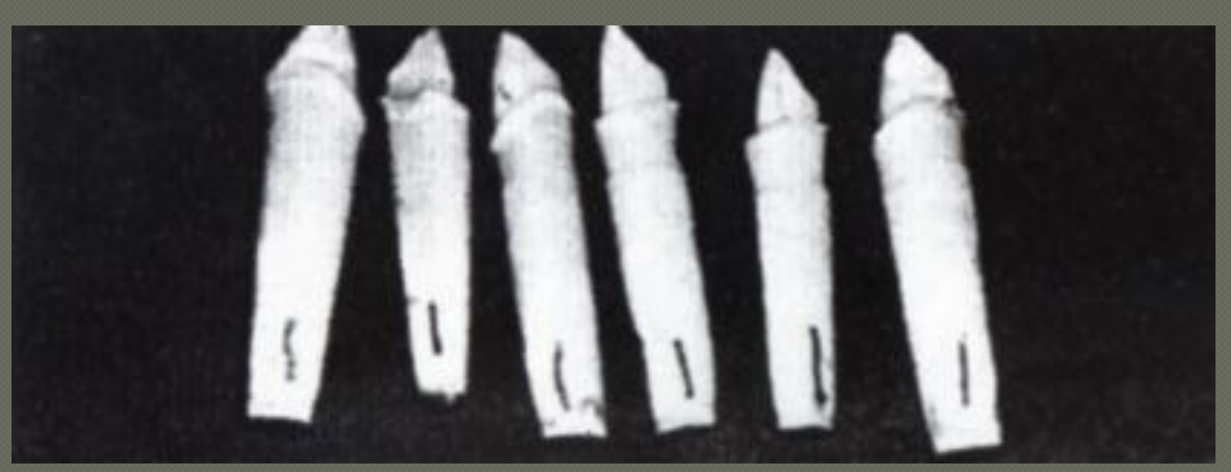
A precision saw aids sectioning



The sectioned cast


CP Rail

III. Single Die





Single Copper band impression technique:

Indication:

- Impression for a single full metal crown preparation.

Used either impression compound or rubber base impression material.

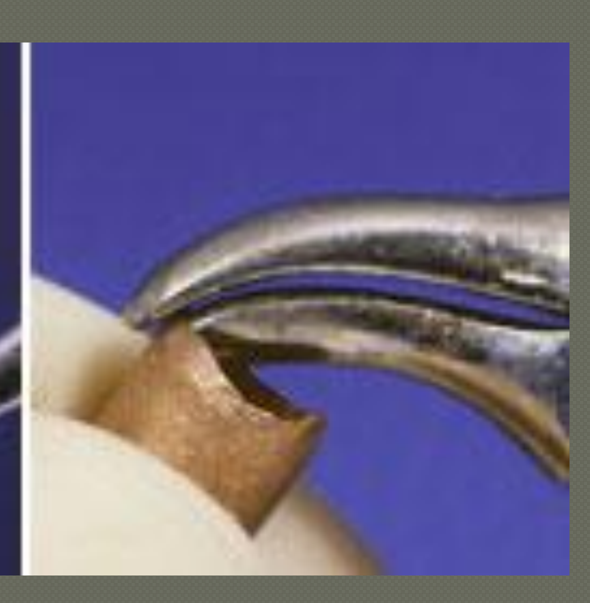
Copper band are supplied in different sizes and diameter to fit for anterior, premolars and molars.

Copper band impression













Types Of Single Dies

1. Stone die
2. Amalgam die
3. Acrylic or epoxy die
4. Refractory die
5. Electroplated die (silver or copper)

Amalgam die

Used only with copper bands with impression compound

Advantages:

- Very hard die

- Disadvantages

- Dimensionally unstable (setting expansion)
- Long setting time

Electroplated die

Electrolytic deposition of a coat of pure metal on the impression

Advantage:

- High accuracy
- Dimensional stability
- High strength
- High abrasion resistan



DISADVANTAGE:

-time consuming
-expensive
-special equipment is needed

A. Copper plated die

- Impression compound
- Or Silicon rubber base

Metalizing stage

The impression compound metalized by painting graphite.

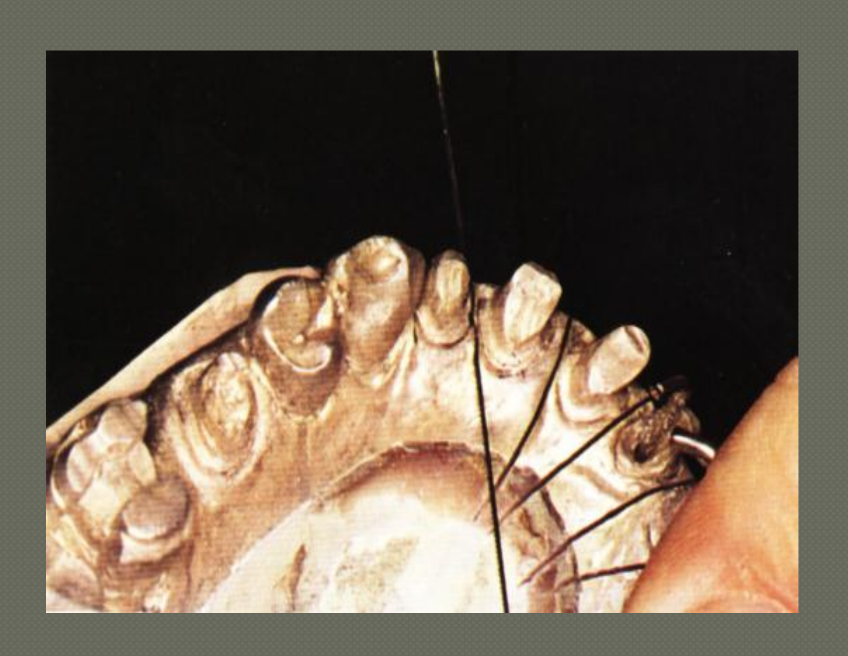
The impression rubber base metalized by copper powder.

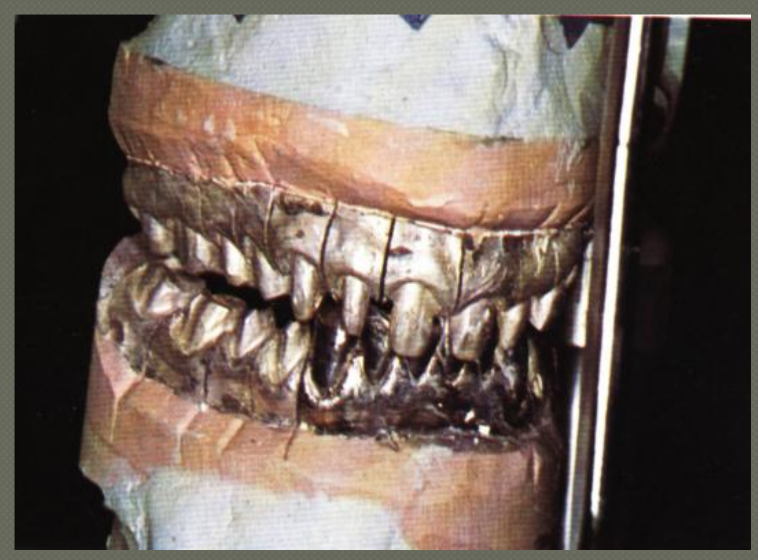
- Impression connected to cathode (-ve)



- Impression submerged into tank solution(electrolyte):
- Copper sulfate.
- Sulfuric acid.
- Phenosulforic acid.
- Distilled water.

- Copper plate at anode must be 8 inches away from impression.
- 20 mA current
- 12 hours plating
- After complete plating ,pouring the impression with stone or resin.





B. Silver plated die

- The impression material is rubber base.



- Impression submerged into tank solution(electrolyte):

1. Silver cyanide
2. Potassium cyanide
3. Potassium carbonate
4. Distilled water

- Bar of silver as anode (+ve),
- placed 4 inches away from impression
- 10 mA current
- 12 hours plating

-definitions

-Requirements of casts and dies

-selection criteria of die materials

-die materials

-casts and dies systems


ANNE GEDDES
Thank you